Implementing Layer-2 Multicast with IGMP Snooping

Internet Group Management Protocol (IGMP) snooping restricts multicast flows at Layer 2 to only those segments with at least one interested receiver. This module describes how to implement IGMP snooping.

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Prerequisites for IGMP Snooping

Before implementing IGMP snooping, make sure that the network is configured with a Layer 2 VPN (L2VPN).

Restrictions for IGMP Snooping

- IGMP snooping is supported only under L2VPN bridge domains.
- Explicit host tracking (an IGMPv3 snooping feature) is not supported.
- IPv6 Multicast Listener Discovery (MLD) snooping is not supported.
- IGMPv1 is not supported.
- IGMP snooping with VPLS on bridge domain is not supported.
- IGMP snooping over Access Pseudo-wire is not supported.
- ISSU is not supported on Layer 2 Multicast.

Note IPv4 multicast is supported for a multicast source that is behind the BVI interface. For example, the below configuration shows how to configure source behind BVI for IPv4 multicast:

```
l2vpn
bridge group 1
  bridge-domain 1
   multicast-source ipv4
   igmp snooping profile grp1
   !
   interface TenGigE0/0/0/3.32
   !
   routed interface BVI1
```

IGMP snooping for bridge domains without Bridged Virtual Interface (BVI) is supported with the following design consideration: You must configure the multicast-source ipv4 command in the source switch where bridge domain and IGMP snooping are enabled.

IGMP Snooping Overview

Description of Basic Functions

IGMP snooping provides a way to constrain multicast traffic at Layer 2. By snooping the IGMP membership reports sent by hosts in the bridge domain, the IGMP snooping application can set up Layer 2 multicast forwarding tables to deliver traffic only to ports with at least one interested member, significantly reducing the volume of multicast traffic.

Configured at Layer 3, IGMP provides a means for hosts in an IPv4 multicast network to indicate which multicast traffic they are interested in and for routers to control and limit the flow of multicast traffic in the network at Layer 3.

IGMP snooping uses the information in IGMP membership report messages to build corresponding information in the forwarding tables to restrict IP multicast traffic at Layer 2. The forwarding table entries are in the form <Route, OIF List>, where:

- Route is a <*, G> route or <S, G> route, where * is any source, G is group and S is the source.
- OIF List comprises all bridge ports that have sent IGMP membership reports for the specified route plus all multicast router (mrouter) ports in the bridge domain.

Implemented in a multicast network, IGMP snooping has the following attributes:

- In its basic form, it reduces bandwidth consumption by reducing multicast traffic that would otherwise flood an entire VPLS bridge domain.
- With the use of some optional configurations, it provides security between bridge domains by filtering the IGMP reports received from hosts on one bridge port and preventing leakage towards the hosts on other bridge ports.
- Using optional configurations, reduces the traffic impact on upstream IP multicast routers by suppressing IGMP membership reports (IGMPv2) or by acting as an IGMP proxy reporter (IGMPv3) to the upstream IP multicast router.

High Availability Features

All high availability features apply to the IGMP snooping processes with no additional configuration beyond enabling IGMP snooping. The following high availability features are supported:

- Process restarts
- RP Failover
- Stateful Switch-Over (SSO)
- Non-Stop Forwarding (NSF)—Forwarding continues unaffected while the control plane is restored following a process restart or route processor (RP) failover.
- Line card online insertion and removal (OIR)

Bridge Domain Support

IGMP snooping operates at the bridge domain level. When IGMP snooping is enabled on a bridge domain, the snooping functionality applies to all ports under the bridge domain, including:

- Physical ports under the bridge domain.
- Ethernet flow points (EFPs)—An EFP can be a VLAN, VLAN range, list of VLANs, or an entire interface port.
- Ethernet bundles—Ethernet bundles include IEEE 802.3ad link bundles and Cisco EtherChannel bundles. From the perspective of the IGMP snooping application, an Ethernet bundle is just another EFP. The forwarding application in the randomly nominates a single port from the bundle to carry the multicast traffic.

IGMP snooping for bridge domains without Bridged Virtual Interface (BVI) is supported with the following design consideration:

You must configure the **multicast-source ipv4** command in the source switch where IGMP snooping is enabled as seen in the following example:

```
l2vpn
bridge group 1
bridge-domain 1
multicast-source ipv4
igmp snooping profile grp1
!
interface TenGigE0/0/0/3.31 //Source
!
interface TenGigE0/0/0/3.32
!
routed interface BVI1
```

Multicast Router and Host Ports

IGMP snooping classifies each port (for example, EFPs, PWs, physical ports, or EFP bundles) as one of the following:

- Multicast router ports (mrouter ports)—These are ports to which a multicast-enabled router is connected. Mrouter ports are usually dynamically discovered, but may also be statically configured. Multicast traffic is always forwarded to all mrouter ports, except when an mrouter port is the ingress port.
- Host ports—Any port that is not an mrouter port is a host port.

Multicast Traffic Handling within a Bridge Domain with IGMP Snooping Enabled

The following tables describe traffic handling behaviors by IGMP snooping and host ports.

By default, IGMP snooping supports IGMPv2 and IGMPv3. The version of the IGMP querier discovered in the bridge domain determines the operational version of the snooping processes. If you change the default, configuring IGMP snooping to support a minimum version of IGMPv3, IGMP snooping ignores any IGMPv2 queriers.

Table 1: Multicast Traffic Handling for an IGMPv2 Querier

Traffic Type	Received on Host Ports
IP multicast source traffic	Forwards to all host ports that indicate interest.
IGMP general queries	Forwarded to all the ports that are part of the bridge domain
IGMP group-specific queries	Dropped
IGMPv2 joins	Examines (snoops) the reports. • If report suppression is enabled, forwards first join for a new group or first join following a general query for an existing group. • If report suppression is disabled, forwards on all mrouter ports.
IGMPv3 reports	Ignores
IGMPv2 leaves	Invokes last member query processing.

Table 2: Multicast Traffic Handling for an IGMPv3 Querier

Traffic Type	Received on Host Ports
IP multicast source traffic	Forwards to all mrouter ports and to host ports that indicate interest.
IGMP general queries	Forwarded to all the ports that are part of the bridge domain
IGMP group-specific queries	Forwarded to all the ports that are part of the bridge domain
IGMPv2 joins	Handles as IGMPv3 IS_EX{} reports.
IGMPv3 reports	• If proxy reporting is enabled—For state changes or source-list changes, generates a state change report on all mrouter ports. • If proxy reporting is disabled—Forwards on all mrouter ports.

Traffic Type	Received on Host Ports
IGMPv2 leaves	Handles as IGMPv3 IS_IN{} reports.

Information About IGMP Snooping Configuration Profiles

To enable IGMP snooping on a bridge domain, you must attach a profile to the bridge domain. The minimum configuration is an empty profile. An empty profile enables the default configuration options and settings for IGMP snooping, as listed in the Default IGMP Snooping Configuration Settings, on page 6.

You can attach IGMP snooping profiles to bridge domains or to ports under a bridge domain. The following guidelines explain the relationships between profiles attached to ports and bridge domains:

- Any IGMP Snooping profile attached to a bridge domain, even an empty profile, enables IGMP snooping. To disable IGMP snooping, detach the profile from the bridge domain.
- An empty profile configures IGMP snooping on the bridge domain and all ports under the bridge using default configuration settings.
- A bridge domain can have only one IGMP snooping profile attached to it (at the bridge domain level) at any time. Profiles can be attached to ports under the bridge, one profile per port.
- Port profiles are not in effect if the bridge domain does not have a profile attached to it.
- IGMP snooping must be enabled on the bridge domain for any port-specific configurations to be in effect.
- If a profile attached to a bridge domain contains port-specific configuration options, the values apply to all of the ports under the bridge, including all mrouter and host ports, unless another port-specific profile is attached to a port.
- When a profile is attached to a port, IGMP snooping reconfigures that port, disregarding any port configurations that may exist in the bridge-level profile.

Creating Profiles

To create a profile, use the **igmp snooping profile** command in global configuration mode.

Attaching and Detaching Profiles

To attach a profile to a bridge domain, use the **igmp snooping profile** command in l2vpn bridge group bridge domain configuration mode. To attach a profile to a port, use the **igmp snooping profile** command in the interface configuration mode under the bridge domain. To detach a profile, use the **no** form of the command in the appropriate configuration mode.

When you detach a profile from a bridge domain or a port, the profile still exists and is available for use at a later time. Detaching a profile has the following results:

- If you detach a profile from a bridge domain, IGMP snooping is deactivated in the bridge domain.
- If you detach a profile from a port, IGMP snooping configuration values for the port are instantiated from the bridge domain profile.

Changing Profiles

You cannot make changes to an active profile. An active profile is one that is currently attached.

- If the active profile is configured under the bridge, you must detach it from the bridge, and reattach it.
- If the active profile is configured under a specific bridge port, you must detach it from the bridge port, and reattach it.

Another way to do this is to create a new profile incorporating the desired changes and attach it to the bridges or ports, replacing the existing profile. This deactivates IGMP snooping and then reactivates it with parameters from the new profile.

Default IGMP Snooping Configuration Settings

Table 3: IGMP Snooping Default Configuration Values

Scope	Feature	Default Value
Bridge Domain	IGMP snooping	Disabled on a bridge domain until an enabling IGMP snooping profile is attached to the bridge domain.
	internal querier	By default Internal Querier is disabled. To enable Internal Querier, add it to the IGMP snooping profile. Internal Querier is not recommended, when BVI and IGMP snooping is configured under a bridge.
	last-member-query-count	2
	last-member-query-interval	1000 (milliseconds)
	minimum-version	2 (supporting IGMPv2 and IGMPv3)
	querier query-interval	60 (seconds) **Note** This is a nonstandard default value.
	report-suppression	Enabled (enables report suppression for IGMPv2 and proxy-reporting for IGMPv3)
	querier robustness-variable	2
	router alert check	Enabled
	tcn query solicit	Disabled
	tcn flood	Enabled
	ttl-check	Enabled
	unsolicited-report-timer	1000 (milliseconds)

Scope	Feature	Default Value
Port	immediate-leave	Disabled
	mrouter	No static mrouters configured; dynamic discovery occurs by default.
	router guard	Disabled
	static group	None configured

IGMP Snooping Configuration at the Bridge Domain Level

IGMP Minimum Version

The **minimum-version** command determines which IGMP versions are supported by IGMP snooping in the bridge domain:

- When minimum-version is 2, IGMP snooping intercepts IGMPv2 and IGMPv3 messages. This is the default value.
- When minimum-version is 3, IGMP snooping intercepts only IGMPv3 messages and drops all IGMPv2 messages.

IGMPv1 is not supported. The scope for this command is the bridge domain. The command is ignored in a profile attached to a port.

Group Membership Interval, Robustness Variable, and Query Interval

The group membership interval (GMI) controls when IGMP snooping expires stale group membership states. The **show igmp snooping group** command shows groups with an expiry time of 0 until that stale state is cleaned up following the next query interval.

The GMI is calculated as:

GMI = (robustness-variable * query-interval) + maximum-response-time

where:

- maximum-response-time (MRT) is the amount of time during which receivers are required to report their membership state.
- robustness-variable is an integer used to influence the calculated GMI.
- query-interval is the amount of time between general queries.

Values for the components in the GMI are obtained as follows:

- MRT is advertised in the general query, for both IGMPv2 and IGMPv3.
- If the querier is running IGMPv2, IGMP snooping uses the IGMP-snooping-configured values for the robustness-variable and query-interval. These parameter values must match the configured values for the querier. In most cases, if you are interacting with other Cisco routers, you should not need to explicitly configure these values—the default values for IGMP snooping should match the default values of the

querier. If they do not, use the **querier robustness-variable** and **querier query-interval** commands to configure matching values.

- IGMPv3 general queries convey values for robustness-variable and query-interval (QRV and QQI, respectively). IGMP snooping uses the values from the query, making the IGMP snooping GMI exactly match that of the querier.

Multicast over Integrated Routing Bridging Active/Active Multihome

Multicast over integrated routing bridging active/active multihome feature enables the routers to quickly and safely switch traffic between routers, during failure, without any traffic loss. This feature comprises of the following four sub features that work together as a solution:

- First, IGMPv2 snooping is enabled for the peer routers to know which Layer 2 interface has receiver interested in a particular group.
- After snooping, this information is synced to the peer routers with the Layer 2 EVPN sync feature.
- After both peer routers are synced, they act like a last hop router and send PIM join upstream.
- Once the traffic arrives on both the peer routers, only one peer router forwards the traffic to the receiver with the designated forwarder election feature.

How to Configure IGMP Snooping

The first two tasks are required to configure basic IGMP snooping configuration.

Creating an IGMP Snooping Profile

SUMMARY STEPS

1. **configure**
2. **igmp snooping profile** *profile-name*
3. Optionally, add commands to override default configuration values.
4. **commit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**igmp snooping profile** *profile-name* **Example:** `RP/0/RP0/CPU0:router(config)# igmp snooping profile`	Enters IGMP snooping profile configuration mode and creates a named profile. The default profile enables IGMP snooping. You can commit the new profile without any additional

	Command or Action	Purpose
	`default-bd-profile`	configurations, or you can include additional configuration options to the profile. You can also return to the profile later to add configurations, as described in other tasks in this module.
Step 3	Optionally, add commands to override default configuration values.	If you are creating a bridge domain profile, consider the following: • An empty profile is appropriate for attaching to a bridge domain. An empty profile enables IGMP snooping with default configuration values. • You can optionally add more commands to the profile to override default configuration values. • If you include port-specific configurations in a bridge domain profile, the configurations apply to all ports under the bridge, unless another profile is attached to a port. If you are creating a port-specific profile, consider the following: • While an empty profile could be attached to a port, it would have no effect on the port configuration. • When you attach a profile to a port, IGMP snooping reconfigures that port, overriding any inheritance of configuration values from the bridge-domain profile. You must repeat the commands in the port profile if you want to retain those configurations. You can detach a profile, change it, and reattach it to add commands to a profile at a later time.
Step 4	**commit**	

Where to Go Next

You must attach a profile to a bridge domain or to a port to have it take effect. See one of the following tasks:

Attaching a Profile and Activating IGMP Snooping on a Bridge Domain

To activate IGMP snooping on a bridge domain, attach an IGMP snooping profile to the bridge domain, as described in the following steps.

SUMMARY STEPS

1. **configure**
2. **l2vpn**
3. **bridge group** *bridge-group-name*

4. **bridge-domain** *bridge-domain-name*
5. **multicast-source ipv4**
6. **igmp snooping profile** *profile-name*
7. **commit**
8. **show igmp snooping bridge-domain detail**
9. **show l2vpn bridge-domain detail**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**l2vpn** **Example:** `RP/0/RP0/CPU0:router(config)# l2vpn`	Enters Layer 2 VPN configuration mode.
Step 3	**bridge group** *bridge-group-name* **Example:** `RP/0/RP0/CPU0:router(config-l2vpn)# bridge group GRP1`	Enters Layer 2 VPN VPLS bridge group configuration mode for the named bridge group.
Step 4	**bridge-domain** *bridge-domain-name* **Example:** `RP/0/RP0/CPU0:router(config-l2vpn-bg)# bridge-domain ISP1`	Enters Layer 2 VPN VPLS bridge group bridge domain configuration mode for the named bridge domain.
Step 5	**multicast-source ipv4** **Example:** `RP/0/RP0/CPU0:router(config)# multicast-source ipv4`	Configures Layer 2 multicast routes with IGMP snooping.
Step 6	**igmp snooping profile** *profile-name* **Example:** `RP/0/RP0/CPU0:router(config-l2vpn-bg-bd)# igmp snooping profile default-bd-profile`	Attaches the named IGMP snooping profile to the bridge domain, enabling IGMP snooping on the bridge domain.
Step 7	**commit**	

	Command or Action	Purpose
Step 8	**show igmp snooping bridge-domain detail** **Example:** `RP/0/RP0/CPU0:router# show igmp snooping bridge-domain detail`	(Optional) Verifies that IGMP snooping is enabled on a bridge domain and shows the IGMP snooping profile names attached to bridge domains and ports.
Step 9	**show l2vpn bridge-domain detail** **Example:** `RP/0/RP0/CPU0:router# show l2vpn bridge-domain`	(Optional) Verifies that IGMP snooping is implemented in the forwarding plane (Layer 2) on a bridge domain.

Detaching a Profile and Deactivating IGMP Snooping on a Bridge Domain

To deactivate IGMP snooping on a bridge domain, remove the profile from the bridge domain using the following steps.

Note A bridge domain can have only one profile attached to it at a time.

SUMMARY STEPS

1. **configure**
2. **l2vpn**
3. **bridge group** *bridge-group-name*
4. **bridge-domain** *bridge-domain-name*
5. **no igmp snooping disable**
6. **commit**
7. **show igmp snooping bridge-domain detail**
8. **show l2vpn bridge-domain detail**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**l2vpn** **Example:** `RP/0/RP0/CPU0:router(config)# l2vpn`	Enters Layer 2 VPN configuration mode.
Step 3	**bridge group** *bridge-group-name* **Example:**	Enters Layer 2 VPN VPLS bridge group configuration mode for the named bridge group.

	Command or Action	Purpose
	`RP/0/RP0/CPU0:router(config-l2vpn)# bridge group GRP1`	
Step 4	**bridge-domain** *bridge-domain-name* **Example:** `RP/0/RP0/CPU0:router(config-l2vpn-bg)# bridge-domain ISP1`	Enters Layer 2 VPN VPLS bridge group bridge domain configuration mode for the named bridge domain.
Step 5	**no igmp snooping disable** **Example:** `RP/0/RP0/CPU0:router(config-l2vpn-bg-bd)# no igmp snooping disable`	Detaches the IGMP snooping profile from the bridge domain, disabling IGMP snooping on that bridge domain. **Note** Only one profile can be attached to a bridge domain at a time. If a profile is attached, IGMP snooping is enabled. If a profile is not attached, IGMP snooping is disabled.
Step 6	**commit**	
Step 7	**show igmp snooping bridge-domain detail** **Example:** `RP/0/RP0/CPU0:router# show igmp snooping bridge-domain detail`	(Optional) Verifies that IGMP snooping is disabled on a bridge domain.
Step 8	**show l2vpn bridge-domain detail** **Example:** `RP/0/RP0/CPU0:router# show l2vpn bridge-domain`	(Optional) Verifies that IGMP snooping is disabled in the forwarding plane (Layer 2) on a bridge domain.

Attaching and Detaching Profiles to Ports Under a Bridge

Before you begin

IGMP snooping must be enabled on the bridge domain for port-specific profiles to affect IGMP snooping behavior.

SUMMARY STEPS

1. **configure**
2. **l2vpn**
3. **bridge group** *bridge-group-name*
4. **bridge-domain** *bridge-domain-name*
5. **interface** *interface-type interface-number*
6. **multicast-source ipv4**

7. Do one of the following:
   - **igmp snooping profile** *profile-name*
   - **no igmp snooping**
8. **commit**
9. **show igmp snooping bridge-domain detail**
10. **show l2vpn bridge-domain detail**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**l2vpn** **Example:** `RP/0/RP0/CPU0:router(config)# l2vpn`	Enters Layer 2 VPN configuration mode.
Step 3	**bridge group** *bridge-group-name* **Example:** `RP/0/RP0/CPU0:router(config-l2vpn)# bridge group GRP1`	Enters Layer 2 VPN bridge group configuration mode for the named bridge group.
Step 4	**bridge-domain** *bridge-domain-name* **Example:** `RP/0/RP0/CPU0:router(config-l2vpn-bg)# bridge-domain ISP1`	Enters Layer 2 VPN bridge group bridge domain configuration mode for the named bridge domain.
Step 5	**interface** *interface-type interface-number* **Example:** `RP/0/RP0/CPU0:router(config-l2vpn-bg-bd)# interface gig 1/1/1/1`	Enters Layer 2 VPN VPLS bridge group bridge domain interface configuration mode for the named interface or PW.
Step 6	**multicast-source ipv4** **Example:** `RP/0/RP0/CPU0:router(config)# multicast-source ipv4`	Configures L2 multicast routes in L2 multicast with IGMP Snooping.
Step 7	Do one of the following: • **igmp snooping profile** *profile-name* • **no igmp snooping**	Attaches the named IGMP snooping profile to the port. **Note** A profile on a port has no effect unless there is also a profile attached to the bridge.

	Command or Action	Purpose
	Example: `RP/0/RP0/CPU0:router(config-l2vpn-bg-bd-if)# igmp snooping profile mrouter-port-profile`	The **no** form of the command detaches a profile from the port. Only one profile can be attached to a port.
Step 8	**commit**	
Step 9	**show igmp snooping bridge-domain detail** **Example:** `RP/0/RP0/CPU0:router# show igmp snooping bridge-domain detail`	(Optional) Verifies that IGMP snooping is enabled on a bridge domain and shows the IGMP snooping profile names attached to bridge domains and ports.
Step 10	**show l2vpn bridge-domain detail** **Example:** `RP/0/RP0/CPU0:router# show l2vpn bridge-domain`	(Optional) Verifies that IGMP snooping is implemented in the forwarding plane (Layer 2) on a bridge domain.

Verifying Multicast Forwarding

SUMMARY STEPS

1. **configure**
2. **show l2vpn forwarding bridge-domain** [*bridge-group-name*:*bridge-domain-name*] **mroute ipv4** [**group** *group_IPaddress*] [**hardware** {**ingress** | **egress**}] [**detail**]**location** *node-id*
3. **show l2vpn forwarding bridge-domain** [*bridge-group-name*:*bridge-domain-name*] **mroute ipv4 summary location** *node-id*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure**	
Step 2	**show l2vpn forwarding bridge-domain** [*bridge-group-name*:*bridge-domain-name*] **mroute ipv4** [**group** *group_IPaddress*] [**hardware** {**ingress**	**egress**}] [**detail**]**location** *node-id* **Example:** `RP/0/RP0/CPU0:routershow l2vpn forwarding bridge-domain bg1:bd1 mroute ipv4 group 234.192.4.1 hardware ingress detail location 0/1/cPU0`	Displays multicast routes as they are converted into the forwarding plane forwarding tables. Use optional arguments to limit the display to specific bridge groups or bridge domains. If these routes are not as expected, check the control plane configuration and correct the corresponding IGMP snooping profiles.
Step 3	**show l2vpn forwarding bridge-domain** [*bridge-group-name*:*bridge-domain-name*] **mroute ipv4 summary location** *node-id*	Displays summary-level information about multicast routes as stored in the forwarding plane forwarding tables. Use

	Command or Action	Purpose
	Example: `RP/0/RP0/CPU0:router# show l2vpn forwarding bridge-domain bg1:bd1 mroute ipv4 summary location 0/3/CPU0`	optional arguments to limit the display to specific bridge domains.

Configuration Examples for IGMP Snooping

The following examples show how to enable IGMP snooping on Layer 2 VPLS bridge domains on :

Configuring IGMP Snooping on Physical Interfaces Under a Bridge: Example

1. Create two profiles.

```
igmp snooping profile profile1
!
igmp snooping profile profile2
   mrouter
!
```

2. Configure two physical interfaces for L2 transport.

```
interface GigabitEthernet0/8/0/38
   negotiation auto
   l2transport
   no shut
   !
!
interface GigabitEthernet0/8/0/39
   negotiation auto
   l2transport
   no shut
   !
!
```

3. Add interfaces to the bridge domain. Attach bridge_profile to the bridge domain and port_profile to one of the Ethernet interfaces. The second Ethernet interface inherits IGMP snooping configuration attributes from the bridge domain profile.

```
l2vpn
  bridge group bg1
     bridge-domain bd1
     igmp snooping profile profile1
     interface GigabitEthernet0/8/0/38
       igmp snooping profile profile2
     interface GigabitEthernet0/8/0/39

!
  !
!
```

4. Verify the configured bridge ports.

```
show igmp snooping port
```

Configuring IGMP Snooping on VLAN Interfaces Under a Bridge: Example

1. Configure two profiles.

```
multicast-source ipv4
igmp snooping profile profile1
multicast-source ipv4
igmp snooping profile profile2
!
```

2. Configure VLAN interfaces for L2 transport.

```
interface GigabitEthernet0/8/0/8
   negotiation auto
   no shut
   !
!
interface GigabitEthernet0/8/0/8.1 l2transport
   encapsulation dot1q 1001
   mtu 1514
   !
!
interface GigabitEthernet0/8/0/8.2 l2transport
   encapsulation dot1q 1002
   mtu 1514
   !
!
```

3. Attach a profile and add interfaces to the bridge domain. Attach a profile to one of the interfaces. The other interface inherits IGMP snooping configuration attributes from the bridge domain profile.

```
l2vpn
  bridge group bg1
     bridge-domain bd1
     multicast-source ipv4
     igmp snooping profile profile1
     interface GigabitEthernet0/8/0/8.1
       multicast-source ipv4
       igmp snooping profile profile2
     interface GigabitEthernet0/8/0/8.2

     !
  !
!
```

4. Verify the configured bridge ports.

```
show igmp snooping port
```

Configuring IGMP Snooping on Ethernet Bundles Under a Bridge: Example

1. Configure two IGMP snooping profiles.

```
multicast-source ipv4
       igmp snooping profile profile1
       !
       multicast-source ipv4
       igmp snooping profile profile2
```

2. Configure interfaces as bundle member links.

```
       interface GigabitEthernet0/0/0/0
         bundle id 1 mode on
         negotiation auto
       !
       interface GigabitEthernet0/0/0/1
         bundle id 1 mode on
         negotiation auto
       !
       interface GigabitEthernet0/0/0/2
         bundle id 2 mode on
         negotiation auto
       !
       interface GigabitEthernet0/0/0/3
         bundle id 2 mode on
         negotiation auto
       !
```

3. Configure the bundle interfaces for L2 transport.

```
interface Bundle-Ether 1
          l2transport
          !
       !
       interface Bundle-Ether 2
          l2transport
          !
       !
```

4. Add the interfaces to the bridge domain and attach IGMP snooping profiles.

```
       l2vpn
         bridge group bg1
            bridge-domain bd1
            multicast-source ipv4
            igmp snooping profile profile1
            interface bundle-Ether 1
              multicast-source ipv4
              igmp snooping profile profile2
            interface bundle-Ether 2

            !
         !
      !
```

5. Verify the configured bridge ports.

```
show igmp snooping port
```

Configuring Multicast over Integrated Routing Bridging Active/Active Multihome

Configurations performed on peer 1:

1. Layer 2 Base Configuration

```
hostname peer1
!
interface Bundle-Ether2
!
interface Bundle-Ether2.2 l2transport
 encapsulation dot1q 2
 rewrite ingress tag pop 1 symmetric
!
interface TenGigE0/0/0/0
 bundle id 2 mode on
 no shut
!
```

2. EVPN Configuration

```
hostname peer1
!
router bgp 100
 bgp router-id 1.1.1.1
 bgp graceful-restart
 address-family l2vpn evpn
 !
 neighbor 3.3.3.3
  remote-as 100
  update-source Loopback0
  address-family l2vpn evpn
  !
 !
!
evpn
 evi 2
  advertise-mac
  !
 !
 interface Bundle-Ether2
  ethernet-segment
   identifier type 0 02.02.02.02.02.02.02.02.02
   bgp route-target 0002.0002.0002
  !
 !
!
```

3. IGMPv2 Snoop Configurations

```
hostname peer1
!
router igmp

  version 2
 !
!
```

```
l2vpn
 bridge group VLAN2
  bridge-domain VLAN2
   multicast-source ipv4
   igmp snooping profile 1
   interface Bundle-Ether2.2
   !

   evi 2
   !
  !
 !
multicast-source ipv4
igmp snooping profile 1
!
```

Configurations Performed on Peer 2:

1. Layer 2 Base Configuration

```
hostname peer2
!
interface Bundle-Ether2
!
interface Bundle-Ether2.2 l2transport
 encapsulation dot1q 2
 rewrite ingress tag pop 1 symmetric
!
interface TenGigE0/0/0/0
 bundle id 2 mode on
 no shut
!
```

2. EVPN Configuration

```
hostname peer2
!
router bgp 100
 bgp router-id 2.2.2.2
 bgp graceful-restart
 address-family l2vpn evpn
 !
 neighbor 3.3.3.3
  remote-as 100
  update-source Loopback0
  address-family l2vpn evpn
  !
 !
!
evpn
 evi 2
  advertise-mac
  !
 !
 interface Bundle-Ether2
  ethernet-segment
   identifier type 0 02.02.02.02.02.02.02.02.02
   bgp route-target 0002.0002.0002
  !
 !
!
```

3. IGMPv2 Snoop Configurations

```
hostname peer2
!
```

```
router igmp

  version 2
 !
!
l2vpn
 bridge group VLAN2
  bridge-domain VLAN2
   multicast-source ipv4
   igmp snooping profile 1
   interface Bundle-Ether2.2
   !

   evi 2
   !
  !
 !
multicast-source ipv4
igmp snooping profile 1
!
```

Verifying IGMP Snooping and EVPN Sync

In this example, the receiver sends an IGMPv2 join for the group 239.0.0.2. On Peer2, this group has a D Flag, that means the actual IGMP joined peer2, but not peer1. On Peer1, this group has a B flag, that means this group is learnt from BGP with the EVPN sync feature.

```
RP/0/RP0/CPU0:peer1#show igmp snooping group
Fri Aug 31 22:27:46.363 UTC

Key: GM=Group Filter Mode, PM=Port Filter Mode
Flags Key: S=Static, D=Dynamic, B=BGP Learnt, E=Explicit Tracking, R=Replicated

                          Bridge Domain VLAN10:VLAN10

Group           Ver GM Source          PM Port                      Exp   Flgs
-----           --- -- ------          -- ----                      ---   ----
239.0.0.2       V2  -  *               -  BE2.2                     never B


RP/0/RP0/CPU0:peer2#show igmp snooping group
Fri Aug 31 22:27:49.686 UTC

Key: GM=Group Filter Mode, PM=Port Filter Mode
Flags Key: S=Static, D=Dynamic, B=BGP Learnt, E=Explicit Tracking, R=Replicated

                          Bridge Domain VLAN10:VLAN10

Group           Ver GM Source          PM Port                      Exp   Flgs
-----           --- -- ------          -- ----                      ---   ----
239.0.0.2       V2  -  *               -  BE2.2                     74    D
```

Verifying Dual DR PIM Uplink

In this example, when the source 126.0.0.100 sends traffic to group 239.0.0.2, you see both Peer1 and Peer2 are sending PIM join upstream. The incoming interface for (*,G) and (S,G) should be the interface toward

the RP and source respectively. For both Peer1 and Peer2, the outgoing interface should be the BVI interface facing the receiver.

```
RP/0/RP0/CPU0:peer1#show mrib route
:
:

(*,239.0.0.2) RPF nbr: 30.0.0.4 Flags: C RPF
  Up: 00:13:41
  Incoming Interface List
    HundredGigE0/0/0/1 Flags: A NS, Up: 00:13:41
  Outgoing Interface List
    BVI2 Flags: F NS LI, Up: 00:13:41

(126.0.0.100,239.0.0.2) RPF nbr: 30.0.0.4 Flags: RPF
  Up: 00:03:34
  Incoming Interface List
    HundredGigE0/0/0/1 Flags: A, Up: 00:03:34
  Outgoing Interface List
    BVI2 Flags: F NS, Up: 00:03:34
:
:

RP/0/RP0/CPU0:peer2#show mrib route
:
:

(*,239.0.0.2) RPF nbr: 50.0.0.4 Flags: C RPF
  Up: 00:13:33
  Incoming Interface List
    HundredGigE0/0/0/2 Flags: A NS, Up: 00:13:33
  Outgoing Interface List
    BVI2 Flags: F NS LI, Up: 00:13:33

(126.0.0.100,239.0.0.2) RPF nbr: 50.0.0.4 Flags: RPF
  Up: 00:03:24
  Incoming Interface List
    HundredGigE0/0/0/2 Flags: A, Up: 00:03:24
  Outgoing Interface List
    BVI2 Flags: F NS, Up: 00:03:24
:
:
```

Verifying Designated Forwarder Election

As described in the previous example, both peer1 and peer2 have BVI2 as outgoing interface. However, only one of the peer should forward the traffic. Designated forwarder election elects one of them to do the forwarding. In this example, peer2 is selected as the forwarder. Peer1 has Bundle-Ether2.2 marked as NDF.

```
RP/0/RP0/CPU0:peer1#show l2vpn forwarding bridge-domain VLAN2:VLAN2 mroute ipv4 hardware
ingress detail location 0/0/cPU0
Bridge-Domain: VLAN2:VLAN2, ID: 0
:
:

Bridge-Domain: VLAN2:VLAN2, ID: 0
  Prefix: (0.0.0.0,239.0.0.2/32)
  P2MP enabled: N
  IRB platform data: {0x0, 0x2d, 0x0, 0x0}, len: 32
  Bridge Port:
  EVPN, Xconnect id: 0x80000001 NH:2.2.2.2
  Bundle-Ether2.2, Xconnect id: 0xa0000015 (NDF)
```

```
RP/0/RP0/CPU0:peer2#show l2vpn forwarding bridge-domain VLAN2:VLAN2 mroute ipv4 hardware
ingress detail location 0/0/cPU0
:
:

Bridge-Domain: VLAN2:VLAN2, ID: 0
  Prefix: (0.0.0.0,239.0.0.2/32)
  P2MP enabled: N
  IRB platform data: {0x0, 0x30, 0x0, 0x0}, len: 32
  Bridge Port:
  EVPN, Xconnect id: 0x80000001 NH:1.1.1.1
  Bundle-Ether2.2, Xconnect id: 0xa0000029
```

Additional References

Related Documents

Related Topic	Document Title
Configuring MPLS VPLS bridges	Implementing Virtual Private LAN Services on Cisco IOS XR Software module in the *MPLS Configuration Guide for Cisco NCS 560 Series Routers*
Getting started information	
Configuring EFPs and EFP bundles	*Interface and Hardware Component Configuration Guide for Cisco NCS 560 Series Routers*

Standards

Standards[1]	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

[1] Not all supported standards are listed.

MIBs

MIBs	MIBs Link
No MIBs support IGMP snooping.	To locate and download MIBs using Cisco IOS XR software, use the Cisco MIB Locator found at the following URL and choose a platform under the Cisco Access Products menu: http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

RFCs	Title
RFC-4541	Considerations for Internet Group Management Protocol (IGMP) and Multicast Listener Discovery (MLD) Snooping Switches

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport